Please cancel Claims 13-18 without prejudice.

Please add the following new Claims 19-29.

CLEAN VERSION - REPLACEMENT PAGES

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now in more detail and by reference characters to the drawings, which illustrate preferred embodiments of the present invention, C_1 illustrates an electrical transmission cable having a reinforced plastic composite load bearing core 10 and a plurality of outer layers of aluminum wire 12 and 14 extending thereabout.

By further reference to Figure 1, it can be seen that the load bearing core 10 includes a solid reinforced plastic composite member. Also, in the embodiment as illustrated in Figure 1 and the subsequently illustrated and described embodiments, there are three outer aluminum layers 12, 18 and 14 (see Figure 1), although it should be understood that any number of outer layers could be employed depending upon the desired thickness of the outer current conducting sheath to be formed over the core. It can be observed that in this construction, the cable C_1 is similar in appearance to a conventional steel core cable. Consequently, it can be laid in the same fashion or suspended in the same fashion and using the same equipment as that employed for a steel core cable.

Also by further reference to Figure 1, it can be observed that the aluminum layers 12 and 14 are formed of individual wire bundles 16 and 16^1 which are helically wound about the central core 10. Thus, the wires can be wound or otherwise applied in any conventional fashion upon the core.

In a preferred embodiment, the strands of reinforcing material

are formed of any suitable reinforcing fiber, such as glass, boron, carbon or the like. Moreover, the resin matrix which is used to bind the strands may be formed of any suitable thermoplastic resin or thermosetting resin. Some of the thermosetting resins which may be used include, for example, various phenolics and epoxies and many polyesters which are conventionally known for that purpose. However, the thermoplastic resins are preferred and include, for example, polypropylene, polycarbonates, etc.

Any of a number of commercially available resins can be employed for impregnating the fibers. It is only critical that the matrix should, at some stage of the process, be capable of being liquefied and softened for a period of time sufficient to flow around the fibers or filaments.

It is preferred to use individual ropes or strands of thermoplastic resin along with the individual strands of the fiber reinforcing strands. Thus, the resin strands can be commingled with the fiber strands and they can be applied as a bundle. Otherwise, the resin strands can be applied individually with the fiber strands. Upon heating, the resin will then soften and liquefy and flow around the individual fiber containing strands. When the resin is allowed to harden, an inner core will therefore be formed.

Although not illustrated, the individual first layer of aluminum wire bundle is applied in a first winding stage. Thus, the aluminum wires of the bundle can actually be wound about the

central core after formation of same. Thereafter, the central core with the first layer of aluminum wires is passed through a second winding stage in which the second and outer layer 14 of aluminum wires of the second wire bundle are wound about the first outer layer. If additional outer layers are desired, the product is then passed through a third winding stage, etc.

It should also be understood in connection with the present invention that aluminum is only one form of current carrying conductor which could be employed as the outer skin. Thus, copper or other high current conductivity materials could be used for this purpose.

The composite core can be formed in any of a variety of ways. For example, the composite core could be extruded, as such. However, preferably, the reinforced composite when formed as a rod in the embodiment as shown, would preferably be pultruded. Several processes for this pultrusion operation are described in numerous U.S. patents as, for example, U.S. Patent No. 3,650,864 to William Brandt Goldsworthy, U.S. Patent No. 3,576,705 to William Brandt Goldsworthy, U.S. Patent No. 3,769,127 to William Brandt Goldsworthy, and U.S. Patent No. 3,579,402 to William Brandt Goldsworthy, et al.

The embodiment of Figure 1 is primarily effective for only short length cables. This is due to the fact that the reinforced plastic core 10 is not capable of significant bending movement. It may be appreciated that the entire cable must be capable of being

wound about a drum and transported for a substantial distance where it would then be unwound from the drum and either suspended or laid at a site of use. For this purpose, the central core 10 is preferably formed of a plurality of individually shaped core sections 20, as best shown in the cable C_2 of Figure 2. In this particular case, the individual sections 20, when assembled together, create a cylindrically shaped cable 22.

In the embodiment of the invention as shown in Figure 2, six individual pie-shaped sections are provided. However, any number of sections could be provided. In connection with the present invention, it has been found that the five individual sections are preferred inasmuch as this is the number of sections which allow for a bending of the cable and a winding of the cable about a spool and which nevertheless do not create an unduly large number of sections forming the cable. In this particular case, the cable is also cylindrical in construction. This is preferred inasmuch as conventional cable using a steel core is now formed with a cylindrically shaped construction. However, any cross sectional shape could be employed.

The cable C_2, as shown in the embodiment of Figure 2, is also wrapped with layers of electrically conductive material as, for example, individual aluminum wires 24 and 26 which form the two outer electrically conductive layers. Again, any desired number of layers could be used. Furthermore, in the embodiment of Figure 2, the individual strands 24 and 26 are helically wound about the

central load bearing core 22.

It has also been found in accordance with the present invention that it is desirable to have an odd number of individual sections as, for example, five, seven or nine individual sections. This allows the cable to be more easily wound about a drum. In addition, it has also been found that by causing a spiraling of the individual sections of the cable over a fairly long distance, that winding of the cable is also more easily obtained. Thus, the cable can be rotated slightly when wound about a drum so as to cause a spiraling of the individual segments. Generally, it is preferred to obtain one spiral per revolution on the drum. This has been found to reduce stresses on the cable and reduce axial build-up of tension-compressive stresses.

In connection with the following described embodiments, like reference numerals will represent like components. Figure 3 illustrates an embodiment of a cable C_3 forming part of the present invention also having a segmented central core 22 and a pair of electrically conductive outer layers 30 and 32 wrapped about the central core. In this particular case, the layers 30 and 32 are formed of individual wires which are laid longitudinally upon the central core. These wires are comprised of individual bands of electrically conductive material. However, in this particular type of construction, the bands must be secured to the conductor usually by circular retaining bands or the like.

Figure 4 illustrates an embodiment of a cable C_4 similar to

the cable C_3, except that in this particular case, the individual pie-shaped sections 20 of the core 22 are formed with an arcuately shaped recess 34 formed at their inner most ends. In this particular embodiment, the inner most ends 34, as shown in Figures 4 and 5, form a cylindrically shaped central, axially extending bore 36 which are sized to receive a fiber optic cable 38. It can be observed that the individual sections are still tightly arranged to form a cylindrically shaped load bearing core 22, but which nevertheless formed the cylindrically shaped fiber optic cable receiving channel 36 without sacrificing the inherent strength of the overall load bearing core.

CLEAN VERSION - REPLACEMENT PAGES

1 (Once Amended)

An electrical current carrying conductor for long distance transmission of electrical current, said current carrying conductor comprising:

a) a relatively solid high tensile strength central load carrying core formed of a fiber containing reinforced composite material and being of sufficient cross-sectional size to support the high tensile loading on the conductor and having a sufficiently high tensile strength to carry the entire loading carried by a steel core in a conventional cable; and

b) an outer highly conductive electrical current carrying sheath completely surrounding said load carrying core for carrying electrical current over said long distance and where said sheath carries only a small amount of tensile loading on the conductor.

2 (Resubmitted)

The electrical current carrying conductor of Claim 1 further characterized in that said outer sheath is comprised of aluminum.

CLEAN VERSION - REPLACEMENT PAGES

3 (Resubmitted)

The electrical current carrying conductor of Claim 1 further characterized in that said reinforced composite material is comprised of a plurality of aligned reinforcing fibers embedded in a thermoplastic composite matrix.

4 (Resubmitted)

The electrical current carrying conductor of Claim 1 further characterized in that said central load carrying core is comprised of a plurality of individual sections which are capable of being separated from one another for purposes of splicing.

5 (Once Amended)

The electrical current carrying conductor of Claim 4 further characterized in that said individual sections are concentrically arranged to form a cylindrically shaped conductor core.

6 (Once Amended)

The electrical current carrying conductor of Claim 5 further characterized in that said individual sections are somewhat trapezoidal shaped and when abutted against one another form a central bore sized to receive a fiber optic cable.

CLEAN VERSION - REPLACEMENT PAGES

7 (Once Amended)

A method of producing a long distance transmission current carrying conductor, said method comprising:

a) bringing a plurality of individual reinforced plastic composite sections together to form a generally cylindrically shaped conductor core and being of sufficient cross-sectional size to support the primary tensile loading on the conductor and having a sufficiently high tensile strength to carry the entire loading carried by a steel core in a conventional cable; and

b) locating on an outer cylindrically shaped surface of said core an outer highly conductive electrical current carrying conductor.

8 (Once Amended)

The method for producing a long distance transmission current carrying conductor of Claim 7 further characterized in that said step of locating the current carrying conductor comprises winding individual wires of a highly conductive current carrying conductor about the central core.

9 (Once Amended)

The method for producing a long distance transmission current carrying cable of Claim 8 further characterized in that said method comprises helically winding said wires about said central core.

CLEAN VERSION - REPLACEMENT PAGES

10 (Once Amended)

The method for producing a long distance transmission current carrying conductor of Claim 7 further characterized in that said outer surface is comprised of aluminum wires.

11 (Once Amended)

The method for producing a long distance transmission current carrying cable of Claim 7 further characterized in that said reinforced plastic composite sections are each comprised of a plurality of aligned reinforcing fibers embedded in a thermoplastic composite matrix.

12 (Once Amended)

The method for producing a long distance transmission current carrying conductor of Claim 7 further characterized in that said method comprises the bringing of the composite sections together about a fiber optic cable so that the current carrying conductor also includes a fiber optic cable extending through said core.

CLEAN VERSION - REPLACEMENT PAGES

20 (New Claim)

An electrical current carrying conductor for long distance transmission of electrical current, said current carrying conductor comprising:

a) a central load carrying core formed of a fiber containing reinforced composite material and being of sufficient cross-sectional size to support the primary tensile loading on the conductor;

b) an outer highly conductive electrical current carrying sheath completely surrounding said load carrying core for carrying electrical current over said long distance and where said sheath carries only a small amount of tensile loading on the conductor;

c) a central bore extending axially through said core; and

d) a fiber optic cable extending through the central bore allowing the conductor to carry electrical current and fiber optic cable signals with the same conductor.

21 (New Claim)

The electrical current carrying conductor of Claim 20 further characterized in that said outer sheath is comprised of aluminum.

CLEAN VERSION - REPLACEMENT PAGES

22 (New Claim)

The electrical current carrying conductor of Claim 21 further characterized in that said reinforced composite material is comprised of a plurality of aligned reinforcing fibers embedded in a thermoplastic composite matrix.

23 (New claim)

The electrical current carrying conductor of Claim 20 further characterized in that said central load carrying core is comprised of a plurality of individual sections which are capable of being separated from one another for purposes of splicing.

24 (New Claim)

The electrical current carrying conductor of Claim 23 further characterized in that said central load carrying core is cylindrically shaped and said individual sections are concentrically arranged to form a cylindrically shaped conductor.

25 (New Claim)

The electrical current carrying conductor of Claim 24 further characterized in that said individual sections are each somewhat trapezoidal shaped with an arcuate inner edge and where all arcuate inner edges form said central bore sized to receive a fiber optic cable.

CLEAN VERSION - REPLACEMENT PAGES

26 (New Claim)

The electrical current carrying conductor for long distance transmission of electrical current of Claim 1 further characterized in that said electrical current carrying sheath is formed of a non-alloyed aluminum.

27 (New Claim)

The electrical current carrying conductor for long distance transmission of electrical current of Claim 26 further characterized in that said current carrying sheath and said solid load carrying core and a bore to receive a fiber optic cable.

28 (New Claim)

The electrical current carrying conductor for long distance transmission of electrical current of Claim 20 further characterized in that said electrical current carrying sheath is formed of a non-alloyed aluminum.

29 (New Claim)

The electrical current carrying conductor for long distance transmission of electrical current of Claim 28 further characterized in that said current carrying sheath and said solid load carrying core and a bore to receive a fiber optic cable.

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